U. S. FOREST SERVICE

RESEARCH NOTE NC-87

NORTH CENTRAL FOREST EXPERIMENT STATION, FOREST SERVICE—U.S. DEPARTMENT OF AGRICULTURE

Folwell Avenue, St. Paul, Minnesota 55101

Germination of Yellow and Paper Birch Seeds After 8 Years Storage

ABSTRACT. — Seeds of yellow and paper birch were stored successfully in closed containers at 36° to 40° F. for 8 years, but viability varied greatly among individual lots.

OXFORD: 232.315.2:181.524:181.525:176.1 *Betula alleghaniensis* **Britt.: 176.1** *B. papyrifera* **Marsh.**

In 1964 I tested the germination of yellow birch (*Betula alleghaniensis* Britt.) and paper birch (*B. papyrifera* Marsh.) seeds after 4 years of storage.[1] At that time, germination percentages for 12 seed lots of each species averaged 60.6 for yellow birch and 78.4 for paper birch. These seeds were collected in the fall of 1960, dried at room temperature for a week or more, and stored in tightly closed bottles at 36° to 40° F. None of the seed lots decreased and most increased in viability during the first 4 years of storage. in testing these same seed lots after 8 years of storage, I found that some germinated almost as well as they did 4 years ago, others declined drastically, and a few lost all viability.

Test conditions in 1968 after 8 years storage were identical to those in 1964: 100 unstratified seeds of each lot were placed on moist perlite in petri dishes and maintained in a greenhouse at about 70° F. for 30 days at a day length extended with fluorescent and incandescent light to 20 hours.

For comparison the results of the previously published tests[1] are listed with the recent results (table 1). The average germination of the yellow birch seed lots increased from 39.3 percent in 1961 to 60.6 percent in 1964, but decreased to 26.4 percent in 1968. Germination of two seed lots changed little between 4 and 8 years of storage, four lots decreased to about one-half of their previous germination, five lots declined drastically, and one lot lost all viability.

The paper birch seed lots increased from an average of 36.6 percent germination in 1961 to 78.4 percent in 1964, and declined to 31.5 percent in 1968. Germination of one seed lot in 1968 was almost as good as 4 years earlier, three lots decreased somewhat, three lots decreased to about one-third of their previous germination, four lots declined drastically, and one lot was inviable.

Table 1.—Germination percentage after 30 days; yellow and paper birch seed collected in 1960

Tree number	Yellow birch: Jan. 1961	Yellow birch: Nov. 1964	Yellow birch: Dec. 1968	Tree number	Paper birch: Jan. 1961	Paper birch: Nov. 1964	Paper birch: Dec. 1968
1899-1	21	33	31	1802-S[1/]	58	79	72
1899-2	5	16	8	1802-N[1/]	--	83	71
1899-3	15	46	12	1903-1	1	86	31
1899-4	10	55	8	1903-2	53	87	7
1899-5	84	87	82	1903-3	46	81	18
1900-1	70	81	68	1903-4	57	85	17
1900-2	81	98	3	1903-5	31	42	2
1900-3	61	72	5	1903-6	29	69	0
1900-4	49	85	65	1904	6	78	27
1900-5	24	26	2	1905	48	99	52
1900-6	21	63	0	1946-G[2/]	--	76	52
1900-7	21	65	33	1946-T[2/]	--	76	29
Average	39.3	60.6	26.4	Average	36.6	78.4	31.5

1/ Seed from two separate stems of same tree.

2/ Lot G collected from ground, Lot T from tree itself.

[1] *Clausen, K. E. Yellow and paper birch seeds germinate well after 4 years' storage. U.S.D.A. Forest Serv. Res. Note LS-69, 2 p. Lake States Forest Exp. Sta., St. Paul, Minn. 1965.*

After 8 years of storage only five seed lots each of yellow and paper birch had a satisfactory germination percentage of 30 percent or higher. The viability of the yellow birch seed lots after 4 years of storage seems to have had little effect on their viability after 8 years of storage. Of the lots that remained essentially unchanged, one originally had a low germination percentage and the other a high percentage. Similarly, of the lots that declined in viability between 4 and 8 years storage, some had relatively poor germination at 4 years, others had very good germination. Even the seed lot that lost all viability during the last 4 years of storage had better than average germination in 1964. As with yellow birch, the viability of the paper birch seed lots after 4 years of storage was unrelated to viability after 8 years of storage; the lot with no viability after 8 years had 69 percent germination after 4 years.

Because moisture content of seed is known to affect its storage life,[2] the moisture content of all 24 seed lots was determined. The yellow birch lots ranged from 2.0 to 8.3 and averaged 5.0 percent moisture, while the paper birch lots ranged from 2.8 to 10.7 and averaged 7.4 percent. How well a seed lot of either species maintained its viability was not consistently related to its moisture content.

As a follow-up on the unexpected increase in the viability of these seed lots during the first 4 years of storage,[1] four lots each of yellow and paper birch seed collected in the fall of 1964 were stored with the first lots under identical conditions in the same cooler. These seed lots were tested for germination as described above during December 1964 and again in December 1968. The yellow birch lots all lost viability during the 4 years of storage, and on the average germination was only about half as good as when fresh (table 2). One lot of paper birch had slightly better germination after 4 years, while the other three lots had poorer germination. Thus, the common pattern was a decrease rather than an increase in viability during storage. Apparently storage life of yellow and paper birch seed varies with the year of collection and the individual trees involved.

Table 2.—Germination percentage after 30 days; yellow and paper birch seed collected in 1964

Tree number	Yellow birch		Tree number	Paper birch	
	Dec. 1964	Dec. 1968		Dec. 1964	Dec. 1968
3290-3	43	16	3225-1	82	44
3290-4	29	19	3225-2	83	86
3290-5	55	24	3225-3	59	44
3290-6	70	37	3225-4	73	14
Average	49.2	24.0	Average	74.2	47.0

Although some lots of yellow and paper birch seed maintained their full viability during 8 years of storage in tightly closed containers at 36° to 40° F., most lots had poorer germination after 8 years than they did after 4 years of storage. The decline was often drastic, and one lot of each species lost all viability during this period. Lots with good germination at 4 years did not necessarily maintain their viability any better than lots with poor germination. While it is possible to store seed of yellow and paper birch successfully for 8 years, individual seed lots vary so much in their storage life that they should always be tested for germination before they are used.

KNUD E. CLAUSEN
Principal Plant Geneticist
Rhinelander, Wisconsin

[2] *U.S.D.A. Forest Service. Woody-plant seed manual. U.S. Dep. Agr. Misc. Public. 654, 416 p., illus. 1948.*